

Early Stage Writing Application for Beginners with Precision Evaluation  
(Alphabet Module)

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# Early Stage Writing Application for Beginners with Precision Evaluation

(Alphabet Module)

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**Abstract**— Alphabets writing is one of an early stage learning which divided into number and alphabet writing. Current existing learning application for alphabet writing commonly focused on learning method, but not for evaluation on their skills and correctness. Thus, the users does not realized their precision and stroke ordering were following the accurate steps or not. Therefore, to overcome these problems, a writing application was developed to evaluate the precision and correctness in alphabet writing by implementing mouse event handler and point-in polygon method. The module of this application focused on early stage writing learning (for alphabet module). The development process of this application used the combination of Waterfall and Rapid Application Development (RAD) in order to ensure the repetitive process in design and implementation were performed. This application built using HTML5, PHP, Java script and JSON language. The result shown that the proposed solution has a capability in identify the weakness of the user writing skill by showing user level of tracing and stroke ordering.

## I. INTRODUCTION

Alphabet is a collection of letters that from combining the letters, words are produced. This makes alphabet was a priority to learn in early children in order to overcome illiterate. One crucial aspect of learning alphabet is through writing. Writing an alphabet its make connection between recognize and speaking the letter. By writing, children can see the ideas of creating the letters and reading it to improvise their learning of alphabets.

During the early of childhoods, its importance for them to know the basic of alphabets as it is essential before learning making words and sentences. Learning the alphabet should begin early in a child's life [1]. Thus, learning how to write the alphabet is one of learning tools on getting know better to recognize the letters. By recognize the alphabet; the children can make preparation before entering kindergarten or primary school as it will make them easy to catch-up learning the alphabet in schools.

Children nowadays are easy to learning through modern technology that implements attractive applications [2]. Through this technology that were vast improve, everything is possible to make it was interesting and caught the children interest. Thus, when they interested in the application, they will easy to adapt the content and applied it in real life. Same goes

to learning application, if the application were built attractive to children, they will tends to used it and learning it in easy way.

Furthermore, as mention above, modern technology easily attracted by children, not only because of the technology itself, the contents of the application also need to be attractive and fun to be explored. There are cute and suitable sound effects and music that make it fun. There are also, colorful buttons, images and backgrounds that cheerful to attract the children. Thus, the children will have fun learning and make them easy to learn the alphabet.

Thus, by building this application, children can have better understanding on learning writing alphabet and then, will easily recognize the alphabet. The learning to write application will help children improve their learning and at the same time learning in fun way. The children will have better preparation and parents will not worry on their children literacy.

## II. PROBLEM STATEMENT

In experiencing technology that spreading widely nowadays, there are plenty of writing alphabet application that existed in application store and online internet. There are problem occurs on system constraints and unsuitable implementation of methods. Thus, several problem needs to be observed for improvise this application and overcome the problem that encounter by the user such as children, parents and teachers.

Traditional methods of learning involve manually writing the alphabet might be less attractive to the children[3]. The teaching method that lack of technology and media used will be bored and not efficient to the children. For instance, writing in book that don't have sound, music and animation that children usually adapted in this modern era.

Mostly all the current applications [4] just show basic learning of writing alphabet and not evaluate the accuracy of writing the alphabet. By evaluating the accuracy, parents and teachers will knew the improvement of the children. For example, the existing system such as at Spinner Pad Application just ask user to write to the page and there is no

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## **CHAPTER ONE**

### **INTRODUCTION**

#### **1.1 Introduction**

Alphabet is a collection of letters that from combining the letters, words are produced. This makes alphabet was a priority to learn in early children in order to overcome illiterate. One crucial aspect of learning alphabet is through writing. Writing an alphabet its make connection between recognize and speaking the letter. By writing, children can see the ideas of creating the letters and reading it to improvise their learning of alphabets.

During the early of childhoods, its importance for them to know the basic of alphabets as it is essential before learning making words and sentences. Learning the alphabet should begin early in a child's life [1]. Thus, learning how to write the alphabet is one of learning tools on getting know better to recognize the letters. By recognize the alphabet; the children can make preparation before entering kindergarten or primary school as it will make them easy to catch-up learning the alphabet in schools.

Children nowadays are easy to learning through modern technology that implements attractive applications [2]. Through this technology that were vast improve, everything is possible to make it was interesting and caught the children interest. Thus, when they interested in the application, they will easy to adapt the content and applied it in real life. Same goes to learning application, if the application were built attractive to children, they will tends to used it and learning it in easy way.

Furthermore, as mention above, modern technology easily attracted by children, not only because of the technology itself, the contents of the application also need to be attractive and fun to be explored. There are cute and suitable sound effects and music that make it fun. There are also, colourful buttons, images and backgrounds that cheerful to attract the children. Thus, the children will have fun learning and make them easy to learn the alphabet.

Thus, by building this application, children can have better understanding on learning writing alphabet and then, will easily recognize the alphabet. The learning to write application will help children improve their learning and at the same time learning in fun way. The children will have better preparation and parents will not worry on their children literacy.

## **1.2 Introduction**

In experiencing technology that spreading widely nowadays, there are plenty of writing alphabet application that existed in application store and online internet. There are problem occurs on system constraints and unsuitable implementation of methods. Thus, several problem needs to be observed for improvise this application and overcome the problem that encounter by the user such as children, parents and teachers.

Traditional methods of learning involve manually writing the alphabet might be less attractive to the children. The teaching method that lack of technology and media used will be bored and not efficient to the children. For instance, writing in book that don't have sound, music and animation that children usually adapted in this modern era.

Mostly all the current applications just show basic learning of writing alphabet and not evaluate the accuracy of writing the alphabet. By evaluating the accuracy, parents and teachers will knew the improvement of the children. For example, the existing system such as at Spinner Pad Application just ask user to write to the page and there is no feedback and score display to show to user their writing skills level[3].

Thus, an application needs to be built to overcome this problem. An application that can teach children writing alphabet and get their writing accuracy calculated for further improvements.

### **1.3 Objective**

The proposed solution need to achieve the objective stated below;

- To study the early stage writing application for beginner with precision evaluation using alphabet module.
- To evaluate the accurateness of alphabet writing by implement the vector graphic approach base on stroke order and coordinate range.
- To develop web application for children beginner learning of writing alphabet.

### **1.4 Scope**

- Data - The data used was the vector graphic (coordinates to form curve and line) of alphabet letter from letter A to Z.
- User - The application targeting children from age 1 to 5 that in early learning phase. It also can be used by teacher or parents for guiding the learning method.
- Module - In building this application, the module involve are writing module and calculating accuracy module for writing the alphabet letters.

## **1.5 Assumption and Constraint**

In early planning for developing this application, a few assumptions were stated as milestone and during building process of the application.

- The system will take time roughly 10 months and estimated to end at December 2013.
- Success or failure of the project is based on performance relative to the development process, and deliverables.

The system is overall implements of web – based system that will operates using web browser and can well-function using Google Chrome. The hardware used is personal computer (PC) devices that easy to handle by all types of user.



## **CHAPTER TWO**

### **LITERATURE REVIEW**

#### **2.1 Introduction**

This chapter discusses all the information relates to Alphabet Writing Application. Firstly, this chapter will be discussed about alphabet writing system including its meaning, type of alphabet and the style will be used in the application. Then, the importance of learning writing will be discussed that explain why learning to write is essential to the children. Next, all the existing system will be analyze for the case study to finds the advantages and disadvantage of every system. Then, the methodology used for this project will be explained in detail for each of its phases. Lastly, in this chapter will be discussed about the tools that will be used including the scripting and the database.

#### **2.2 Alphabet Writing System**

Writing alphabet is part of techniques in learning for alphabet recognition as in 3 learning style preferences includes kinesthetic learning by doing [4]. The symbolic method of visually recording (writing) some language is defined as writing system. While alphabet were a group of letters or basic written symbol to form the languages. Thus, the alphabet writing system is the set of letters that were symbolize by recording into some language. Alphabet writing system is one of important components need to be learn to starting the stage of learning making words and learn the languages.

English alphabet is one of type of alphabet writing system that existed in this world. English alphabet consists of 26 letters starting from A to Z. It consists of Majuscule forms (capital/uppercase letters) and miniscule forms (small/lowercase letters). English alphabet writing style divided into 2 types; there are manuscript and cursive letters. Manuscript can be defined as writing style that commonly used in printing and electronic communication as this

style is easy to read and separated from each other. However, manuscript writing style is slow type of style writing. While cursive is faster than manuscript as it was designed for quick writing the notes by using hand. Cursive writing commonly is handwritten. However, the difficultness of reading the cursive letter is depending on the writer.

### **2.3 Importance in learning alphabet writing**

The most basic foundation for someone learning how to read is the ability of identifies the letters of the alphabet. Everyone learn most effectively is learning using methods or techniques that closely matched with their own preferred style [4]. Learning style preferences divided into 3 styles that was; auditory is learning style by hearing the audio or speech. Next is learning by visual also best known as observations. The person learns by watch the visual aid to memorize it. Lastly, it is learning by doing or defined as kinesthetic. The person is likely to learn by physically such as take notes and experiments. In writing alphabet, the most used learning style is kinesthetic style by learn to write the alphabet. By writing the alphabet, the kids will familiar with the shape, size and direction of each alphabets and practice it repeatedly. The children will be easy to recognize the alphabet as they learn through experience write the alphabet repeatedly.

The importance in learning words and sentence is the letters itself. Each letter is main component to produce words. Thus, its alphabet recognition is essential in learning as to read and speak, the alphabet must be known before knowing how to spell and making words. Moreover, alphabet is the most writing system that used in this era as alphabet is used in commonly in many countries such as at London, USA and Malaysia. Besides that, English language using alphabet writing system and English language is the most language used in international. Thus, learning to write the alphabet is importance as basic learning before learning the language.

Literacy is fundamental human right and the basic for lifelong learning. The uses of literacy for the exchange of knowledge are vastly evolving, through the advances in technology. Based on statistic by National Adult Literacy Survey, (1002) NCES, U.S. Department of Education, children who have not developed some basic literacy skills by the time they enter school are likely 3-5 times more to drop out of schools several years later [5]. Writing and reading is the most needed skill involve for literacy skill. The important of writing alphabet can

be concluded to prevent from illiteracy among kids as it's the important path to success in future.

Thus, to conclude all the explanation, writing alphabet is basic step for lifelong learning that proof that every child must learn it. Teacher, parents and guardian must take extra care and make sure the children can master the writing techniques and continue to learning to read and further their study and thus, become successful person.

## 2.4 Stroke Order for Writing Alphabet

Stroke is the lines produce either straight lines or curve lines. In order to create alphabet, one or more strokes were combined. There are different types of strokes, there are straight strokes as seen in letters k, l, v, w, x, y and z. In straight strokes, it divided into three types which are; horizontal (bar), vertical (stem) and diagonal. While there are also rounded strokes or curved strokes as in letters c, o and s. Rounded strokes (bowl) divided into open and closed types [6]. Stroke started with instroke where one starts writing the letter and outstroke which where the pen leaves of. All strokes mentioned above were just a basic stroke in anatomy of typeface. However, there are many other strokes time involved in building letter such as stem, serif, bowl and etc.

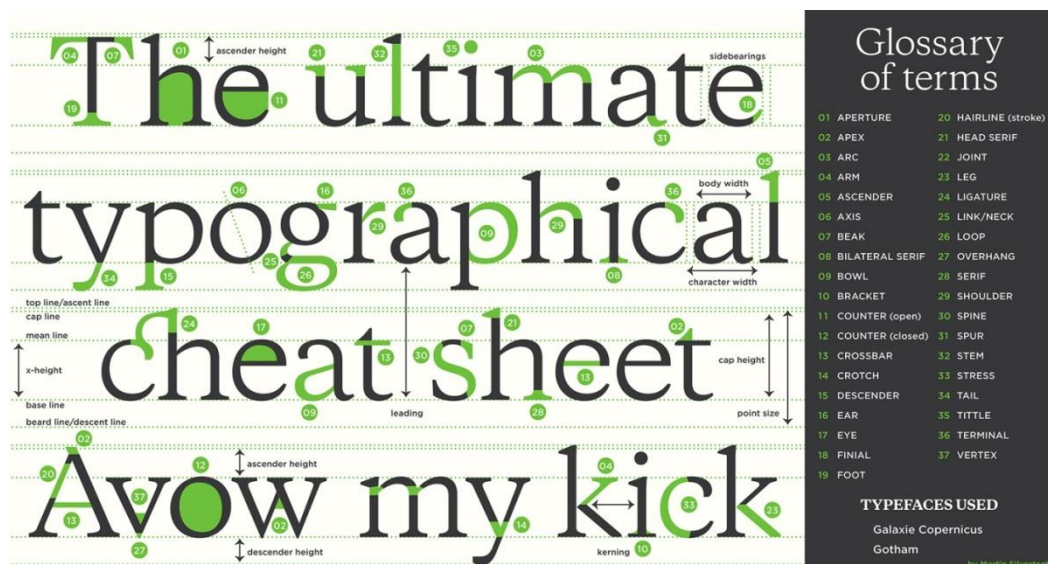


Figure 2.4.1 : All type of strokes involve in anatomy typeface of alphabet [7].

In learning to write, the basic strokes identified need to be applied and have to be stressed out for better understanding. By these simple strokes, children can easily learn to write the alphabet because the stroke is simplified enough for children to draw the lines.

Farris maintains, "By age 3, children produce drawings that are composed of the same basic lines that constitute manuscript letters: (1) vertical lines, (2) horizontal lines, and (3) circles... Because of such early experience, most 6 and 7 year-olds can create these vertical and horizontal lines more easily than the relatively complicated connections associated with D'Nealian manuscript or cursive handwriting. Because vertical lines are made with a straight up-and-down motion and horizontal lines by a left-to-right motion, they rely predominately on already acquired gross motor skills" [8].

Unlike in Chinese character writing, the strokes order is not importance in writing English alphabets is as long the final result look same with the alphabet. But, in early of learning, usually children will apply the techniques based on their observation. Thus, the order of the strokes to produce the alphabet can guide the children to produce better writing. The teachers or parents can give guidance for the order of writing the strokes as beginning of learning to write. After they master the writing skills, the children can use their own writing style and strokes order.



Figure 2.4.2 : Stroke order for upercase letters.



Figure 2.4.3 : Stroke order for lowercase letters.

Therefore, for alphabet writing application that focus for the children beginner learning, the strokes for making the alphabet has to focused on and the order of stroke were applied for guide the children in primary learning for better writing results.

## 2.5 Drawing Techniques and Touch Screen Devices for Writing Alphabet Application Technology

As discussed in subtopic Stroke Order of Alphabets, strokes were main elements that produce the letters. Strokes are a line produce either straight lines or curved lines. While line is drawing terms that can be define as a type of mark that contains both a direction and a length. Thus, in producing the letters in writing, drawing techniques are applied in making the sets of basic lines.

In 2001, Marc Prensky an IT and education writer, popularized the term digital natives to label the first generations of children growing up in the technology of computers, video games, and other devices [9]. Children in this generation have tendencies in using modern technology such as laptops, tablets computers or any handheld devices specifically involving touch screen. Thus, by building application that applying touch screen technology will attract the children to use the application and consequently they will interest to learn through it.

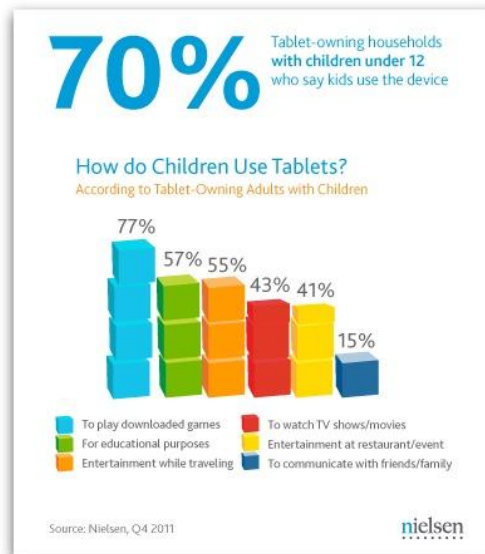


Figure 2.5.1 : Statistic on tablet-owning for families that have children under 12 and used the tablet [10].

Combination of drawing and touch screen device, hence, will produce great application for children. Drawing techniques were applied for writing the alphabet as drawing is part of making the alphabet. By using touch screen, besides than attracting them to use the application, children also can know the movement of writing the alphabet.

## 2.6 Case Studies on Existing Writing Application System

### 2.6.1 Write Uppercase Letters game at [www.turtlediary.com](http://www.turtlediary.com)

Turtlediary website provides tools such as games and exercise for children in elementary school. All preschool learning games, kindergarten games in math and science, first grade games and second grade games for reading help also can be found in this website. Turtlediary provide online learning games and activities because it can maintaining the classic spirit of educational fun and provide learning experiences that build on children's technology skills.



Figure 2.6.1 : Turtlediary logo.



Write Uppercase Letters is a learning to write an alphabet games provided by Turtlediary website under Preschool English Games category. It focus on children at age 3 to 5 using virtual alphabet writing lesson for preschoolers. Its objective is for kids learn how to identify and write alphabet from A to Z in uppercase.

#### Contents of the application

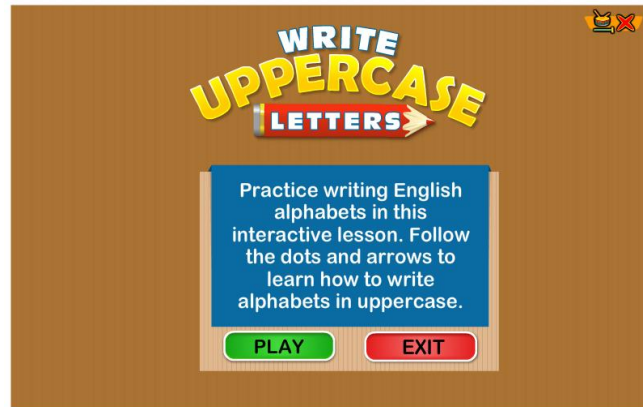


Figure 2.6.2 : Main page of Write Uppercase Letters application.

Main page of the system shows that it gives the information about the game. It also gives instruction to the user how to practice write in this application. It provides two buttons which button PLAY to enter the application and EXIT to close the application.



Figure 2.6.3 : First alphabet interfaces.

This page consists of the list of the alphabets from A to Z. User can click which alphabet that they wants. The dots will guide the user to write in correct way. The user only needs to mouse over the dots by follow the guide shown in every dot. When mouse over, the writing will show like picture below;

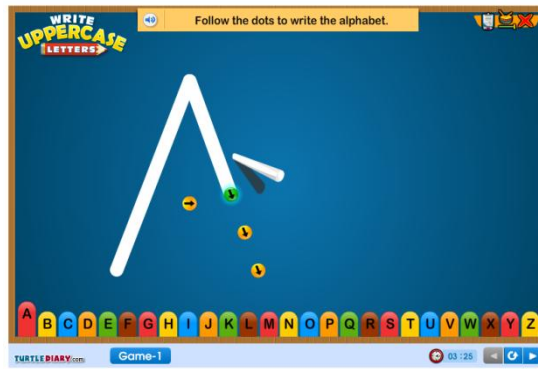


Figure 2.6.4 : The movement of writing the alphabet.



Figure 2.6.5 : Interface after one writing the letter.

When all dots were done followed, the letter will be finished and it will show the picture next to the letter to give example of the alphabet refer to. Then, it will proceed to the next alphabet.

#### Advantages and Disadvantages

Advantages	Disadvantages
<ul style="list-style-type: none"> <li>• Interactive by using multimedia including voice and attractive button sounds.</li> <li>• Provide guide for each steps by using both audio and text direction.</li> <li>• Have stroke order to guide user how to write alphabets.</li> <li>• Colorful and attractive interfaces suitable for children.</li> </ul>	<ul style="list-style-type: none"> <li>• Doesn't have lowercase letter.</li> <li>• Not user friendly because the movement of writing the letter is draw by computer as user only navigate the mouse through each dots.</li> <li>• Don't have writing evaluation.</li> </ul>

Table 2.6.1 : Advantage and Disadvantages of Write Uppercase Letter application



### 2.6.2 Learn to Write Alphabets mobile application

Learn to Write application also known as ABC Guru is a mobile application that developed by Sudheer Kumar Peddireddy. The main function of this application is to teaches how to write numbers and alphabets. This application comes with varies of languages including Tamil, Canadian and Korean language.

#### Contents



Figure 2.6.6 : First interface when user enter the application.



Figure 2.6.7 : Recording user voice.

When user enters this application, it will display as shown in figure 2.6. The application consists of 3 main buttons that guide user to the previous and next letter. Then, user can clear the writing by touch button Clear. Then, user can write the alphabet by it tracing given and record it in the application. User also can record their own voice to learn how to spell the letters as shown in figure 2.7.



Figure 2.6.8 : Color picker for pen color

Besides that, user can pick the color of the pen for writing the letters. It also have other several menus such as change pen width and change the language as shown in figure below.



Figure 2.6.10 : Other menus provide in the application

### Advantages and Disadvantages

Advantages	Disadvantages
<ul style="list-style-type: none"><li>• Provide Multilanguage.</li><li>• Use multimedia by using audio and text media.</li><li>• Can record user writing and audio for spelling the letter.</li><li>• User friendly because have many menus and button to user interact with the system.</li><li>• Have stroke order to guide user how to write alphabets.</li></ul>	<ul style="list-style-type: none"><li>• Do not provide navigation or direction to the user what they need to do.</li><li>• Don't have evaluation of user writing.</li><li>• Design was dull and not attractive enough for children.</li></ul>

Table 2.6.2 : Advantages and Disadvantages of Learn to Write application.

### **2.6.3 Write the alphabet mobile application**

Write the Alphabet is a mobile application developed by Alexandre Minard that available both on iTunes and Android Market. The system teach user how to write alphabet as they will discover how to draw letter and will able to practice to copy the letter repeatedly.

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Figure 2.6.11 : Main interface of Write the Alphabet application.



Figure 2.6.12 : Main menus for the application

Based on figure 2.11, it shows the homepage interface of the application. It provide touch feedback to ask user to enter the system by touch the enter button. Then, menu interface show as can be seen at figure 2.12. This application provides alphabet writing and games to attract the children.

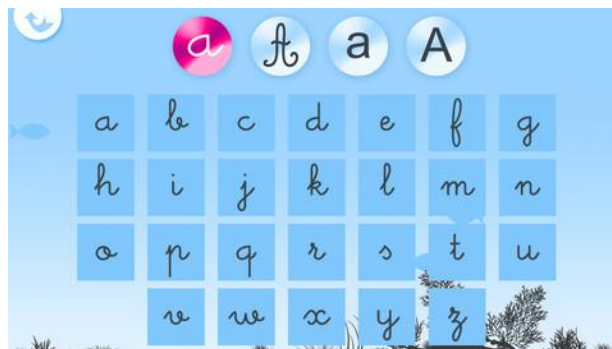


Figure 2.6.13 : All alphabet lowercase and uppercase style for manuscript and cursive style.

In this page, the user can choose 4 different style of alphabet. There are two main styles which is manuscript alphabet and cursive alphabet. Then, for each style, it provides both capital and small letters. User can choose which letter they want to learn to write either cursive, manuscript, uppercase or lowercase letter.

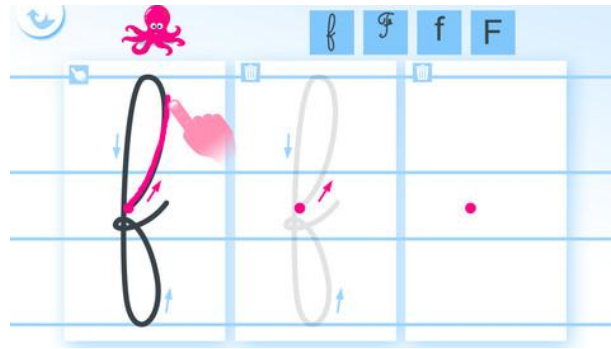


Figure 2.6.14 : Direction show by the application to guide user how to write the letter.

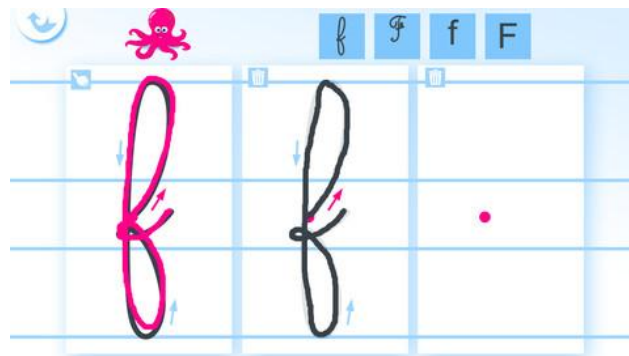


Figure 2.6.15 : User try to write the letter.

In this application, it implement the navigation techniques as it show the step to write the letter first at the first box on the left of the screen. Then, user will write the letter based on the direction given and the tracing font at the background for first trial at the middle box. If the user writes out of the tracing letter and misdirection, the wrong alert will pop up near the wrong line. Then, user will write again the letter without tracing letter at last box on the right of the screen.

#### Advantages and Disadvantages

Advantages	Disadvantages
<ul style="list-style-type: none"> <li>• Design was colorful, cherish and attractive for children.</li> <li>• Have multimedia such as text, sounds and animation.</li> <li>• Provide both manuscript and cursive letters.</li> <li>• Have both uppercase and lowercase</li> </ul>	<ul style="list-style-type: none"> <li>• The evaluation of user writing is to strict and not suitable for children that first time to learn.</li> <li>• Not provide the sound of spelling the words.</li> </ul>

<p>alphabet letters.</p> <ul style="list-style-type: none"> <li>• Provide guide for user writing and have two trials for user to try to write.</li> <li>• User can know the writing is correct or not by the alert for wrong writing.</li> <li>• User friendly by menus and navigation buttons.</li> <li>• Have stroke order to guide user how to write alphabets.</li> </ul>	
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Table 2.6.3 : Advantages and disadvantages of Writing the Alphabet application.

#### 2.6.4 ABC Letter Tracing

One of the techniques children can learn to write is letter tracing. This technique is implemented by ABC Letter Tracing application that was free mobile application for iphone user. Main objective of the application is for children learning to write and recognize their ABC's. It provides both uppercase and lowercase letters for English alphabet. This application also provides real objects that can relate to the alphabet letters to help they learn the alphabet.

##### Contents

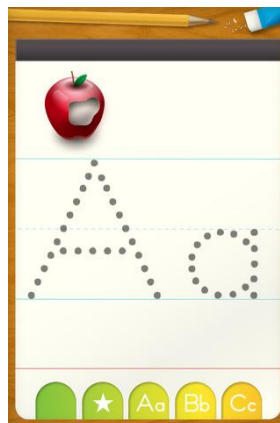


Figure 2.6.16 : First alphabet interface.

This application provides simple design that consists all of the letters at the bottom of the interfaces as shown in figure 2.16. It provides dots tracing of the letter for uppercase and lowercase letter of the alphabet. Then, at the top of the interface, there are real object that can their name start with the alphabet shown.

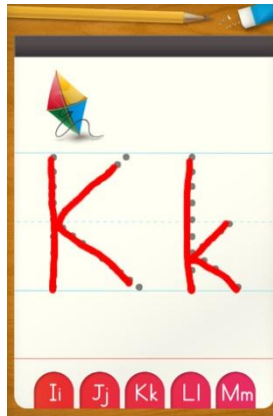


Figure 2.6.17 : The writing write by the user.

User can write overlap the dots tracing and continue to the next alphabet. User also can freely choose which alphabet they want to write.

#### Advantages and Disadvantages

Advantages	Disadvantages
<ul style="list-style-type: none"> <li>• Attractive design suitable for children.</li> <li>• Provide real objects that can relate to alphabet and make the children easy to learn the alphabet.</li> <li>• Provide alphabet tracing using dots techniques.</li> <li>• Have both uppercase and lowercase letters.</li> <li>• Contain sound of spelling the letters.</li> </ul>	<ul style="list-style-type: none"> <li>• Doesn't have feedback for two way communication between application and the user.</li> <li>• Doesn't have evaluation for user writing.</li> <li>• Navigation was not included and make user don't know how to use the application.</li> <li>• Don't have stroke order to guide user how to write alphabets.</li> </ul>

Table 2.6.4 : Advantages and disadvantages of ABC Letter Tracing application

## **2.7 Study on techniques and methods of algorithm.**

### **2.7.1 Mouse eventhandler.**

Event handler is instalment to capture events surrounding including the mouse movement, the position and clicking and other events. The event allows the developer to perform an action when it occurs. All these events are tied to individual elements in the html pages. A specific element on the page must be clicked in order for an onclick or other event to capture.

For touch screen devices, the event handler involved is touch events. Touch events giving ability to the devices to interpret finger activity when it touches the screens or track pads. Touch events consists of four main interfaces or functions [11]. The interfaces are;

1. TouchEvent
  - a. Represent the event that occurs when the state of touches on the surface changes.
2. Touch
  - a. Represent a single point of contact between the user and the touch surface.
3. TouchList
  - a. Represent a group of touches; this is used when the touch events applied multiple fingers touch at the same time.
4. DocumentTouch
  - a. Contains methods to create Touch and TouchList objects.

### **2.7.2 Evaluation Algorithm – Crossing Number Algorithm.**

Through the grid produce in writing the alphabets, it will make polygon that have side at each side of grid boundary. By using this polygon formed, the user writing that consists of several coordinates can be determining whether the coordinates follow the alphabet strokes or not. The method can be used is called Point-in Polygon. Point-in polygon is solution when fundamental problem encountered in two-dimensional computation polygon to decide whether the points lies within the polygon [12].